CLAIMS

1. A method for synthesizing polymers on a substrate using at least one mask having a plurality of reticle areas, wherein each reticle area comprises a plurality of reticles, each of which is associated with a same synthesis area on the substrate, the method comprising the steps of:

(a) for each reticle area, sequentially aligning two or more of the plurality of reticles of that reticle area with the associated synthesis area; and

(b) for each sequential alignment, coupling monomers on the substrate at locations determined by the aligned reticles;

wherein the plurality of reticle areas are substantially contiguously arranged on the mask, and the plurality of reticles within each of the reticle areas are substantially contiguously arranged within the reticle area.

2. The method of claim 1, wherein:

the plurality of reticles in each reticle area are arranged in a same pattern.

3. The method of claim 2, wherein:

the pattern comprises rows and columns of reticles.

4. The method of claim 2, wherein:

each of the plurality of reticles in each reticle area has approximately a same height H and has approximately a same width W; and

step (a) comprises sequentially aligning by translating the at least one mask with respect to the substrate by a sequence of steps, wherein the translation distance at each step is determined by the height H or the width W.

5. The method of claim 4, wherein:

the translating is done by moving the substrate while the mask remains stationary.

6. The method of claim 1, wherein:

the monomers are selected from the group consisting of nucleotides, amino acids or saccharides.

7. The method of claim 1, wherein:

step (b) further comprises coupling a same monomer for each of the aligned reticles.

8. The method of claim 1, wherein:

step (b) further comprises directing light through the aligned reticles to de-protect the locations for coupling.

9. A system for synthesizing polymers on a substrate, comprising:

at least one mask having a plurality of reticle areas, wherein each reticle area comprises a plurality of reticles, each of which is associated with a same synthesis area on the substrate;

an aligner that, for each reticle area, sequentially aligns two or more of the plurality of reticles of that reticle area with the associated synthesis area; and

a synthesizer that, for each sequential alignment, causes monomers to be coupled on the substrate at locations determined by the aligned reticles;

wherein the plurality of reticle areas are substantially contiguously arranged on the mask, and the plurality of reticles within each of the reticle areas are substantially contiguously arranged within the reticle area.

10. The system of claim 9, wherein:

the plurality of reticles in each reticle area are arranged in a same pattern.

11. The system of claim 10, wherein:

the pattern comprises rows and columns of reticles.

12. The system of claim 10, wherein:

each of the plurality of reticles in each reticle area has approximately a same height H and has approximately a same width W; and

the aligner further is constructed and arranged to sequentially align by translating the at least one mask with respect to the substrate by a sequence of steps, wherein the translation distance at each step is determined by the height H or the width W.

13. The system of claim 12, wherein:

the translating is done by moving the substrate while the mask remains stationary.

14. The system of claim 9, wherein:

the monomers are selected from the group consisting of nucleotides, amino acids or saccharides.

15. The system of claim 9, wherein:

the synthesizer further is constructed and arranged to couple a same monomer for each of the aligned reticles.

16. The system of claim 9, wherein:

the synthesizer further is constructed and arranged to direct light through the aligned reticles to de-protect the locations for coupling.

17. A mask for synthesizing polymers on a substrate, comprising:

a plurality of reticle areas substantially contiguously arranged on the mask; and

within each reticle area, a plurality of substantially contiguous reticles, each of which is associated with a same synthesis area on the substrate and is constructed and arranged for synthesizing polymers by enabling the coupling of monomers on the same synthesis area at locations determined by the reticles.

18. The mask of claim 17, wherein:

the plurality of reticles in each reticle area are arranged in a same pattern.

19. The mask of claim 18, wherein:

the pattern comprises rows and columns of reticles.

20. The mask of claim 17, wherein:

the monomers are selected from the group consisting of nucleotides, amino acids or saccharides.

21. A method for manufacturing a mask for synthesizing polymers on a substrate, comprising the steps of:

identifying a plurality of reticle areas substantially contiguously arranged on the mask; and

within each reticle area, constructing and arranging a plurality of substantially contiguous reticles, each of which is associated with a same synthesis area on the substrate and is further constructed and arranged for synthesizing polymers by enabling the coupling of monomers on the same synthesis area at locations determined by the reticles.

22. The method of claim 21, wherein:

the monomers are selected from the group consisting of nucleotides, amino acids or saccharides.

23. A probe array comprising polymers synthesized on a substrate by a method comprising the steps of:

(a) providing at least one mask having a plurality of reticle areas, wherein each reticle area comprises a plurality of reticles, each of which is associated with a same synthesis area on the substrate;

(b) for each reticle area, sequentially aligning two or more of the plurality of reticles of that reticle area with the associated synthesis area; and

(c) for each sequential alignment, coupling monomers on the substrate at locations determined by the aligned reticles;

wherein the plurality of reticle areas are substantially contiguously arranged on the mask, and the plurality of reticles within each of the reticle areas are substantially contiguously arranged within the reticle area.

24. The probe array of claim 23, wherein:

the monomers are selected from the group consisting of nucleotides, amino acids or saccharides.

25. The probe array of claim 23, wherein:

step (c) further comprises coupling a same monomer for each of the aligned reticles.

26. The probe array of claim 23, wherein:

step (c) further comprises directing light through the aligned reticles to de-protect the locations for coupling.

27. A computer program product for synthesizing polymers on a substrate using at least one mask having a plurality of reticle areas, wherein each reticle area comprises a plurality of reticles, each of which is associated with a same synthesis area on the substrate, the product comprising a computer usable medium storing control logic that, when executed on a computer system, performs a method comprising the steps of:

(a) for each reticle area, sequentially aligning two or more of the plurality of reticles of that reticle area with the associated synthesis area; and

(b) for each sequential alignment, coupling monomers on the substrate at locations determined by the aligned reticles;

wherein the plurality of reticle areas are substantially contiguously arranged on the mask, and the plurality of reticles within each of the reticle areas are substantially contiguously arranged within the reticle area.

28. The product of claim 27, wherein:

the monomers are selected from the group consisting of nucleotides, amino acids or saccharides.

29. A method for synthesizing probe arrays of polymers on a substrate using a mask having a plurality of reticle areas, wherein each reticle area comprises a plurality of reticles, each of which is associated with a same synthesis area on the substrate, the method comprising the steps of:

(a) aligning the mask with respect to the substrate so that a first reticle of a first reticle area is aligned with a first synthesis area associated with the plurality of reticles of the first reticle area, and so that a second reticle of the first reticle area is aligned with a first discard area on the substrate;

(b) coupling monomers on the first synthesis area at locations determined by the first reticle;

(c) re-aligning the mask with respect to the substrate so that the second reticle is aligned with the first synthesis area; and

(d) coupling monomers on the first synthesis area at locations determined by the second reticle.

30. The method of claim 29, wherein:

when the first reticle is aligned with the first synthesis area, every reticle of the first reticle area other than the first reticle is aligned with a discard area on the substrate.

31. The method of claim 29, further comprising the step of:

dicing the substrate at least partially within the first discard area.

32. The method of claim 31, wherein:

the dicing physically separates a probe array, including the first synthesis area on the substrate, from at least one other synthesis area on the substrate.

33. The method of claim 31, wherein:

the plurality of reticles in each reticle area are arranged in a same pattern.

34. The method of claim 33, wherein:

the pattern comprises rows and columns of reticles.

35. The method of claim 34, wherein:

the dicing of the substrate is done in a straight line lying entirely within one or more discard areas including the first discard area.

36. The method of claim 29, wherein:

the monomers are selected from the group consisting of nucleotides, amino acids or saccharides.

37. The method of claim 29, wherein:

step (b) further comprises coupling a first monomer and step (d) further comprises coupling the first monomer or a second monomer.

38. The method of claim 29, wherein:

steps (b) and (d) each further comprise directing light through the aligned reticles to de-protect the locations for coupling.

39. A system for synthesizing probe arrays of polymers on a substrate, comprising:

(a) a mask having a plurality of reticle areas, wherein each reticle area comprises a plurality of reticles, each of which is associated with a same synthesis area on the substrate;

(b) an aligner constructed and arranged to

(i) align the mask with respect to the substrate so that a first reticle of a first reticle area is aligned with a first synthesis area associated with the plurality of reticles of the first reticle area, and so that a second reticle of the first reticle area is aligned with a first discard area on the substrate, and

(ii) re-align the mask with respect to the substrate so that the second reticle is aligned with the first synthesis area; and

(c) a synthesizer constructed and arranged to

(i) couple monomers on the first synthesis area at locations determined by the first reticle when the first reticle is aligned with the first synthesis area, and

(ii) couple monomers on the first synthesis area at locations determined by the second reticle when the second reticle is aligned with the first synthesis area.

40. The system of claim 39, wherein:

the monomers are selected from the group consisting of nucleotides, amino acids or saccharides.

41. The system of claim 39, wherein:

the synthesizer further is constructed and arranged to direct light through the aligned reticles to de-protect the locations for coupling.

42. A probe array comprising polymers synthesized on a substrate by a method comprising the steps of:

(a) providing at least one mask having a plurality of reticle areas, wherein each reticle area comprises a plurality of reticles, each of which is associated with a same synthesis area on the substrate;

(b) aligning the mask with respect to the substrate so that a first reticle of a first reticle area is aligned with a first synthesis area associated with the plurality of reticles of the first reticle area, and so that a second reticle of the first reticle area is aligned with a first discard area on the substrate;

(c) coupling monomers on the first synthesis area at locations determined by the first reticle;

(d) re-aligning the mask with respect to the substrate so that the second reticle is aligned with the first synthesis area; and

(e) coupling monomers on the first synthesis area at locations determined by the second reticle.

43. The probe array of claim 42, wherein the method further comprises the step of:

(f) dicing the substrate at least partially within the first discard area.

44. The probe array of claim 43, wherein:

the dicing physically separates the probe array, including the first synthesis area on the substrate, from at least one other synthesis area on the substrate.

45. The probe array of claim 43, wherein:

the plurality of reticles in each reticle area are arranged in a same pattern.

46. The probe array of claim 45, wherein:

the pattern comprises rows and columns of reticles.

47. The probe array of claim 46, wherein:

the dicing of the substrate is done in a straight line lying entirely within one or more discard areas including the first discard area.

48. The probe array of claim 42, wherein:

the monomers are selected from the group consisting of nucleotides, amino acids or saccharides.

49. A computer program product for synthesizing polymers on a substrate using a mask having a plurality of reticle areas, wherein each reticle area comprises a plurality of reticles, each of which is associated with a same synthesis area on the substrate, the product comprising a computer usable medium storing control logic that, when executed on a computer system, performs a method comprising the steps of:

(a) aligning the mask with respect to the substrate so that a first reticle of a first reticle area is aligned with a first synthesis area associated with the plurality of reticles of the first reticle area, and so that a second reticle of the first reticle area is aligned with a first discard area on the substrate;

(b) coupling monomers on the first synthesis area at locations determined by the first reticle;

(c) re-aligning the mask with respect to the substrate so that the second reticle is aligned with the first synthesis area; and

(d) coupling monomers on the first synthesis area at locations determined by the second reticle.

50. The computer program product of claim 49, wherein the method further comprises the step of:

(e) dicing the substrate at least partially within the first discard area.

51. The computer program product of claim 49, wherein:

the monomers are selected from the group consisting of nucleotides, amino acids or saccharides.